

a une si vaste entreprise à diriger que la nôtre, et lorsqu'il s'agit de tirer au clair tous les résultats qu'elle promet. Combien ne se perd-il pas d'argent, de temps et de peines, par des efforts isolés, qui coordonnés convenablement et dirigés vers un but commun porteraient les plus beaux fruits? Combien de données précieuses pour la science ne voient jamais le jour, faute de moyens de les publier?

Je n'hésite pas de dire, que la fondation d'un observatoire physique central en Angleterre me paraît être d'une grande nécessité dans l'état actuel des sciences d'observation, et que l'exemple donné par le gouvernement anglais et par le notre serait bientôt suivi par les autres états.

Veuillez agréer les assurances de ma haute considération et de ma vive amitié.

(Signée) A. T. KUPFFER,
Directeur de l'Observatoire physique central.

3. A Letter from Captain C. M. Elliot, Madras Engineers, to Lieut.-Col. Sabine, For. Sec. R.S., transmitted through the Court of Directors of the East India Company. Communicated by Lieut.-Col. Sabine.

Having undertaken the magnetic survey of the Indian Archipelago at the recommendation of the Royal Society, I think a slight sketch, detailed as briefly as possible, of my operations may not be uninteresting to Sir John Herschel and the Committee of Physics of which he is Chairman, prior to the publication of the Survey. I trust likewise I have acted strictly in accordance with the wishes of those who so kindly recommended me for the Survey, and I hope that my earnest efforts to do my duty will gain for me that approbation which I have under no ordinary difficulties incessantly striven to obtain.

I will in the first place mention the different stations I visited, and then describe in a few words, the way in which the observations were taken.

I have made a most complete survey of Java. At Batavia I established an observatory where observations, magnetic and meteorological, were taken hourly from 3 A.M. to 9 P.M. for nine months. In addition, about fifty stations, where observations of dip, of total intensity, of latitude, longitude, and declination were taken; these were always made by myself, and I am certain they can be depended upon.

In Borneo an observatory was established at Sarawak, where observations were taken quarter-hourly for three months, besides visiting the Dutch settlements of Sambas, Pantianak and Succadana on the western coast.

In Sumatra four months of observation at Padang, besides a magnetic survey comprising about thirty stations. I crossed the equator here as well as at Pantianak in Borneo.

At Singapore I compared the portable instruments with the fixed instruments of the observatory, besides determining the horizontal intensity and dip, which had not been accurately determined previously from insufficiency of means.

At the Cocos or Keeling Islands, six weeks of observation.
 At Sambooongan, in the Island of Mindanao, upwards of a week.
 At Keemah in Celebes, the same.
 At Penang, the same.
 At Moulmein, the same.
 At the Nicobars, the same.
 At Bencoolen in Sumatra, the same.

I will now mention the instruments and the mode of observation at the observatories. The following instruments were registered every hour from 3 A.M. to 9 P.M. Two declinometers, and latterly a third made by Jones; a bifilar magnetometer and its thermometer; a standard barometer and its thermometer by Newman; a standard thermometer and a dry and wet bulb.

On the survey, I employed for the observations four dipping-needles; a portable declinometer with altitude and azimuth instrument for the declination and for latitude; a sextant, artificial horizon and chronometer for the error and rates of the watch, which was but a poor one.

I began work generally at 6 A.M., put up the portable declinometer, and allowed the brass weight and stirrup to swing for a couple of hours thoroughly to take the torsion out of the thread, adjusting it from time to time so that the stirrup might ultimately take up a position in the magnetic meridian; during this period I took the dip. At 8 A.M. I took sights with the sextant, and putting in the collimator magnet, I adjusted the altitude and azimuth to it, and took altitudes and azimuths of the sun, three on the limb direct, and three on the limb reversed, noting the reading on the horizontal limb; at the same time this gave me the reading of the true meridian; the magnetic axis of the collimator magnet was then read off; these observations were usually completed by 9½ A.M.: by 11 A.M. I had finished my observations for horizontal intensity. The small collimator magnet being suspended, the large collimator magnet was placed at four different distances east and west, and the deflecting collimator magnet was then vibrated and 300 oscillations taken.

At 11 A.M. I observed altitudes and azimuths of the sun with the altitude and azimuth instrument for equal altitudes. At noon I took circummeridional altitudes of the sun, three with the limb direct, and three with the limb reversed, for latitude; at 1 P.M. I again took altitudes and azimuths.

By equal altitudes from the mean of the times, I was enabled to check the results given by the sextant for time; and by the azimuths corresponding to the equal altitudes, I checked the observations for the true meridian taken at 9 A.M. for the declination. By this means I was always certain of the results by using different modes of verification.

If I stopped another day at the stations I repeated the observations; if I was going to move off, I packed up the instruments and struck the tents, which generally took me the afternoon and the greater part of the evening, for I had no one to assist me.

At sea, whenever an opportunity offered, I took meteorological observations, viz. the standard thermometer, the dry and wet bulb,

and the temperature of the air and sea at 3 A.M. and P.M., and at 9 A.M. and P.M.; sights for longitude at 9 A.M. and 3 P.M., and latitude at noon; besides the dip three times, and sometimes five times a day; every absolute determination was made by me.

Thus on shore as well as at sea, observations were commenced at 3 A.M., and never terminated till 9 P.M.: I had for my assistant an Indo-Briton.

I will not trouble the Council of the Royal Society with stories of the difficulties I met with; suffice it to say, that a stranger amongst the Dutch, the necessity of conciliating the natives in seeing me employed in a manner so strange to them, travelling in the monsoons and in all weathers, sometimes for hours wet in the saddle, living in huts for weeks, the only shelter being cocoanut leaves, and at sea in a leaky old schooner that was perpetually in danger of foundering, with a captain who was scarcely ever sober,—it is not surprising that once or twice I fell sick. I am now but slowly recovering from Java and Car Nicobar fever caught in the execution of my duty. I take the liberty of adding for the information of the Council of the Royal Society, that I never took a single observation unless I was by myself and my attention undisturbed. If strangers were unfortunate, I waited until they left me. If the weather was against me, I took no observations until it settled. I made it a rule never to be in a hurry, and always to finish one set of observations before I commenced another, and to be as comfortable as circumstances would admit. I am certain that an observation is the more valuable in proportion to the mind being not only at ease, but able to fix itself with undivided attention on the observations. I never, for instance, would think of taking an observation whilst bored by an intruder, or a high wind, or a heavy shower of rain falling. I preferred under such circumstances invariably to sacrifice the observation rather than to record it.

I have the honour of sending to the Council as a specimen of the way in which the work was carried on, some of the absolute determinations made at the Cocos or Keeling Islands; they will be able to see that often after the labours of the day had commenced at 3 A.M., they were not terminated at 9 P.M.; and in order to observe moon-culminating stars, I had sometimes to remain up the greater part of the night, for I had no one on whom I could place any dependence to awake me at the proper time.

Paper A contains the way and order in which the instruments of the observatory were registered.

Paper B. The dip taken at the Cocos, with an example.

Paper C. The horizontal intensity, with an example.

Paper D. The declination, with an example.

Paper E. The latitude, with an example.

Paper F. The longitude from moon-culminating stars.

I have the honour to be, Sir,

Your most obedient Servant,

*Madras,
August 6, 1849.*

*C. M. ELLIOT,
Captain Madras Engineers.*